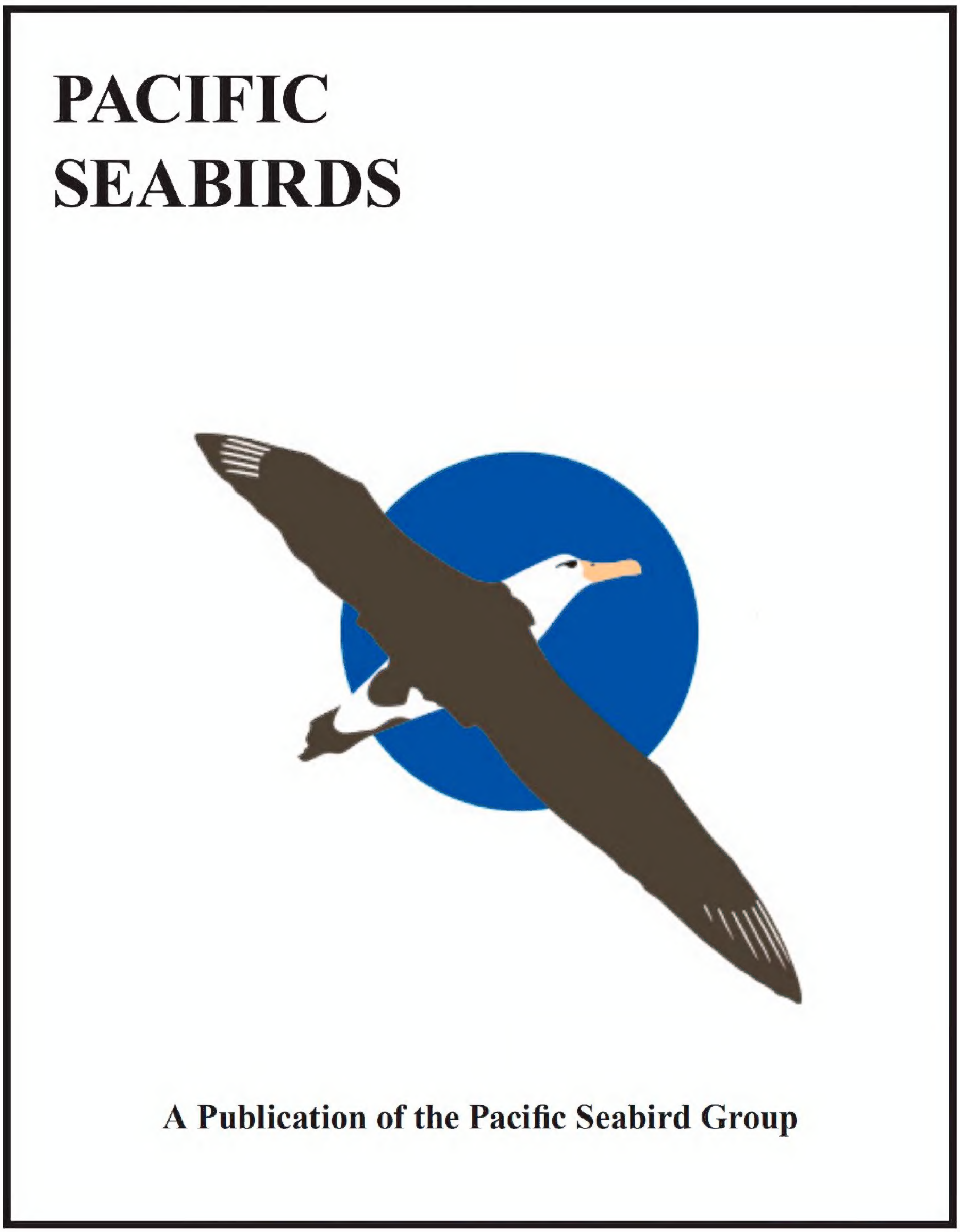
Pacific Seabirds Issue 51(2)

Published November 1, 2024



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Upcoming events and conferences

Compiled by the Pacific Seabirds Committee

Book release event: "*Finding Home, a Hawaiian Petrel's Journey*" by Caren Loebel-Fried

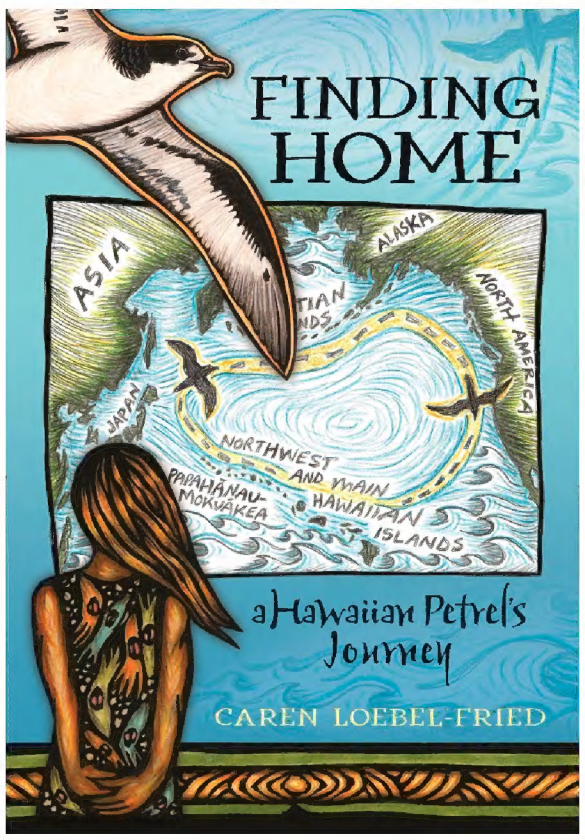
Join artist/author Caren Loebel-Fried for the launch of her new book, "*Finding Home, A Hawaiian Petrel's Journey*" published by University of Hawai'i Press.

Caren will share the behind-the-scenes of this inspiring story, her adventures researching the endangered 'Ua'u, the Hawaiian Petrel, in their colonies throughout the Hawaiian Islands, and how she created the art for this book. Ua'u, Hawaiian Petrels, are endemic Hawaiian seabirds that soar huge distances day and night, powered by wind. They are guided by scent and an inner magnetic map, and only touch land once a year when they meet their life mate at their burrow and together raise one chick.

For 60 million years, 'Ua'u have made a living off the ocean, nesting in Hawai'i far from predators. Hawaiian legends tell of seabirds darkening the sky as they returned from the sea; their guano washes down from the mountaintops, nourishing the land and offshore coral reefs. But since the arrival of humans, 'Ua'u numbers have plummeted to near extinction. "*Finding Home, a Hawaiian Petrel's Journey*" is based on the true story of these amazing seabirds and the people working to save them.

Caren Loebel-Fried is an artist and author from Volcano, Hawai'i, who learned the ancient art of block printing from her mother. Conservation and the natural world are her

inspiration and the foundation of her work. Caren creates award-winning books for children through adults, and art for conservation organizations, government agencies, and Hawaiian Cultural organizations, providing educational materials about wildlife and cultural connections. Caren finds birds to be excellent conservation ambassadors, teaching families and communities about the health of the forest and the ocean. She has done extensive fieldwork with seabirds in their remote breeding grounds throughout Hawai'i. Caren's other award-winning illustrated books include "*A Perfect Day for an Albatross*", "*Manu, the Boy Who Loved Birds*", and "*Hawaiian Legends of the Guardian Spirits*". Original art for Finding Home was acquired by the Hawai'i State Foundation for Culture and the Arts for their "Art in Public Places" program. Caren aims to bring people closer to the natural world in the hope that they will want to help care for it.



California's Central Coast State Parks Association, Mind Walks Lecture Series: "*Finding Home, a Hawaiian Petrel's Journey*"

Location: Virtual (presentation available for viewing online after the event)
Date: November 15, 2024
Time: 1:00pm (PT) virtual presentation

The Waterbird Society and Pacific Seabird Group Joint Meeting

Location: San José, Costa Rica
Date: January 6-10, 2025

Inaugural Oceania Seabird Symposia

Location: University of Auckland, Auckland, Aotearoa New Zealand
Date: April 14-17, 2025

MoP8: The Eighth Session of ACAP's Meeting of the Parties

Location: Dunedin, Aotearoa New Zealand
Date: May 19-23, 2025

11th International Symposium on Avian Influenza

Location: St. John's, Newfoundland, Canada
Date: June 24-26, 2025

Island Invasives 2026

Location: Auckland, Aotearoa New Zealand
Date: February 9-13, 2026

4th World Seabird Conference

Location: Hobart, Tasmania
Date: September 7-10, 2026

Committee updates

Elections Committee

The Elections Committee is looking for members! The PSG Elections Committee solicits volunteers to run for positions on the PSG Executive Council (PSG EXCO). The committee strives to identify at least two candidates for each open EXCO seat. Nomination requests are sent out each summer, and the Elections Committee convenes each fall to review all nominees for the upcoming positions. If there are not enough nominees to put forward 2 candidates for each position, a concerted effort is made to conduct individual outreach based on prior nominations. Once appropriate candidates have been found, the committee sets up a secure online voting system for all current PSG members to vote anonymously.

If you're interested in joining the Elections Committee, please email Jane Dolliver and Katie O'Reilly, Co-Coordinators, at PSG_elections@pacificseabirdgroup.org.

Communications Committee

The Communications Committee is looking for members and future co-chairs!

The Communications Committee is composed of PSG members that volunteer to keep communications and publications running for PSG. The Communications Committee manages the PSG website, PSG Email List, *Pacific Seabirds*, Symposia, Technical Publications, Facebook, Twitter, and Instagram. This committee also maintains the news posts and job opportunities on the PSG website and social media accounts! It may sound like a lot, but this committee is one of the larger PSG committees and there is a place for everyone! Do you love Instagram? We could use your help! Are you a website guru? We've got a role for you! If you're interested in joining the committee or if you'd like to learn more about the opportunities on the committee or what being a chair entails, please feel free to email the current co-chairs, Wieteke and Anna, at communications@pacificseabirdgroup.org.

Member updates

Laura Bliss

Laura Bliss has been a member of the Pacific Seabird Group since her first PSG Group conference in San Jose, CA, in 2015, which was also her first scientific conference. Laura successfully defended her Ph.D. at the University of Manitoba under Drs. Gail Davoren and Jen Zamon in October 2023. She also recently celebrated one year at the West Coast Ocean Data Portal, a job that was advertised on the PSG Job Board. If you want to learn more about the West Coast Ocean Data Portal, please visit https://portal.westcoastoceans.org or contact Dr. Laura at Laura.Bliss@WestCoastOceanAlliance.Org!

Waterbird Society & Pacific Seabird Group 2025 Joint Meeting

By Jennifer Wheeler (jawheeler411@gmail.com)

Mark your calendars—because you won't want to miss this one! The Pacific Seabird Group's 52nd Annual Meeting is teaming up with the Waterbird Society for a **Joint Conference** in San José, Costa Rica, from January 6-9, 2025. It's a historic event, only the fifth time these two societies have joined forces, and it's happening in Costa Rica! For the first time, the Pacific Seabird Group is hosting an Annual Meeting south of Mexico—what a milestone!

Now, we know it's not all about the location, but let's be real: Costa Rica is special. It's one of the most biodiverse countries on the planet! Despite being only the size of Virginia, Costa Rica is packed with wildlife, boasting over 900 bird species—including rare and endemic varieties. Whether you're wandering through lush rainforests, exploring coastal regions, or taking in the misty highland cloud forests, you'll be immersed in avian paradise. Plus, Costa Rica's stellar national parks and protected areas make it a haven for birds and bird lovers alike. Add in warm hospitality, modern amenities, and an inviting atmosphere, and you've got the perfect backdrop for an unforgettable conference.

Oh, and the venue? We'll be at the stunning Marriott Hotel Hacienda Belen, nestled in the heart of a 12-acre coffee plantation. Picture this: a venue modeled after a 16th-century colonial hacienda, with all the modern perks you need for a productive meeting, and plenty of opportunities for relaxation (or adventure) in between sessions. Did we mention the pre- and post-conference field trips? Because there will be plenty!

Of course, the real reason we gather is for professional development and conservation. The Waterbird Society and Pacific Seabird Group were both founded in the 1970s to foster collaboration among researchers, government managers, and conservationists dedicated to protecting aquatic bird species and habitats. Over the years, both organizations have grown to emphasize the importance of cross-border conservation and the human side of protecting these incredible species. This conference celebrates all that progress—and keeps us moving forward.

Our presence in Costa Rica also gives us a chance to support local waterbird conservation efforts. With about 19% of the country's bird species relying on wetland and marine habitats, many of which are migratory, Costa Rica plays a vital role in their life cycles. Yet, there's currently no national campaign focused on protecting endangered waterbirds, and the resources for monitoring and research are limited. By coming together in San José, we'll help foster skill-building, international collaboration, and promote waterbird study and conservation right where it's needed.

So, are you in? Here are a few deadlines you don't want to miss:

- December 5th: Book your lodging—this is when the room block closes.
- December 6th: Late registration closes! Register soon!
- ASAP: Don't forget to book your field trips, snag some conference merchandise and purchase Banquet tickets via the Online Store, and check out the in-person and online Silent AUKtion!

Everything you need to know about the WbS/PSG 2025 Joint Meeting is available here.

Time is flying (just ask the organizers!), so get ready and we'll see you in San José!

Questions? Contact us!

WbS/PSG 2025 Joint Meeting Local Committee
Jennifer Wheeler, Ghisselle Alvarado, and Kyra Mills
locochair@pacificseabirdgroup.org

WbS/PSG 2025 Joint Meeting Scientific Program Chairs
Dan Barton (PSG)
programchair@pacificseabirdgroup.org

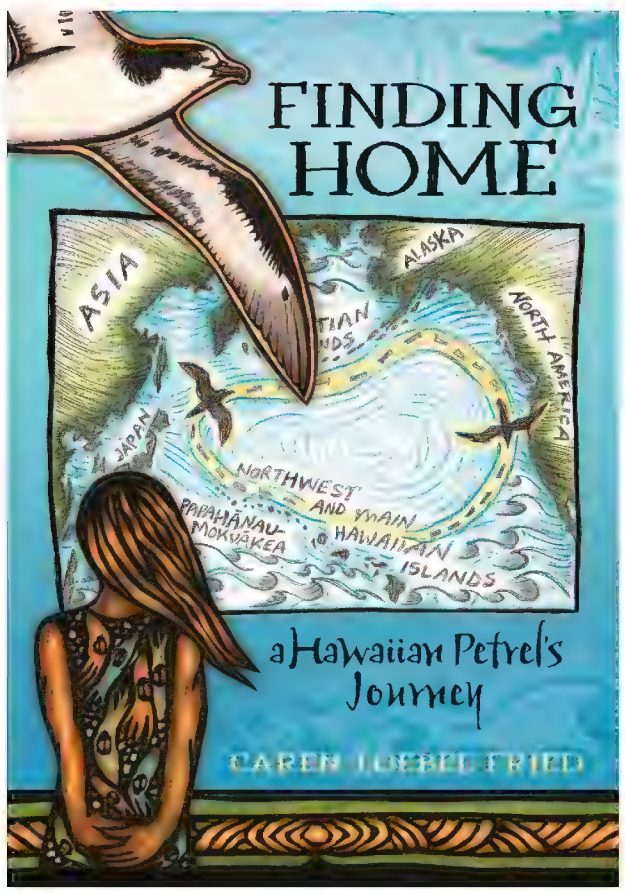
Nellie Tsipoura (WbS)
nellie@waterbirds.org

WbS/PSG 2025 Joint Meeting Communications

Wieteke Holthuijzen & Anna Vallery (PSG)
communications@pacificseabirdgroup.org

Book review: "*Finding Home, a Hawaiian Petrel's Journey*"

By Caren Loebel-Fried, bird conservation artist and author (carenloebelfried@gmail.com)



'Ua'u, Hawaiian Petrels, fly both night and day, powered by the wind. Soaring huge distances effortlessly, they even sleep on the wing, guided by smell and an inner magnetic map. The only time their webbed feet touch land is once a year when they meet their life mate at their burrow and together raise one chick. For the last 60 million years, 'ua'u have made a living off the ocean and nested on remote islands, far from predators. There used to be so many seabirds breeding in the Hawaiian Islands, it was said that their return from the sea to their colonies every evening would darken the sky, and their guano washed down from the mountaintops, nourishing the land and offshore coral reefs. But since the arrival of humans, 'ua'u numbers have plummeted to near extinction.

Caren Loebel-Fried tells the story of the 'ua'u, the Hawaiian Petrel, and the people working to save them in her new, fully illustrated book, "*Finding Home, a Hawaiian Petrel's Journey*", published by University of Hawai'i Press. Caren's extensive research brought her to many 'ua'u people and colonies across the Hawaiian Islands. Her fieldwork and visits included Rachel Sprague at the Hi'i Colony in Lāna'i Hale; Pacific Rim Conservation and partners seabird translocation project at Nihokū at Kīlauea Point National Wildlife Refuge, Kaua'i; Jay Penniman and the Maui Nui Seabird Recovery Project team at Haleakalā; and Charlotte Forbes-Perry for several 'ua'u surveys, helicoptering to camp high up Mauna Loa at colonies within Hawai'i Volcanoes National Park, one season along with Michelle Reynolds and Slater the detector dog.

In "*Finding Home, a Hawaiian Petrel's Journey*", readers experience Caren's adventures through the story of Makani Kealoha Morton. Makani adores ʻuaʻu and grows up marveling at the seabird's magical evening sky-dance and murmurs from their underground burrows. Makani's biologist mom and her team devise a plan to save the seabirds. Ten ʻuaʻu chicks are translocated from their mountain burrows and raised in artificial burrows within a predator exclusion fence at Nihokū, and the specific details of their care are woven into the story. When the chicks start to leave for the sea one by one, Makani's favorite chick is very late to fledge. Makani worries: Will this young petrel survive at sea? Will she return to the refuge to raise her own young? Will the plan to save the ʻuaʻu work? As Makani grows over the years, so does the seabird translocation project at Nihokū, along with the hope it carries for the future of the ʻuaʻu. By the story's end, with the fear of the project failing, Makani finds her own way to make a difference for the seabirds she loves so dearly.

"*Finding Home, a Hawaiian Petrel's Journey*" is fully illustrated with Caren Loebel-Fried's signature hand-colored block prints, in addition to her drawings, and maps. Following the story, an in-depth back section provides scientific facts about the habitat and lifestyle of ʻuaʻu, and their connection to Hawaiian culture and history. The book's middle-grade content includes place-based learning that incorporates natural science, wildlife conservation biology, literature, and art. Appealing to all ages, this hopeful, empowering story brings awareness to the threats humans have brought upon seabirds, and provides many ways that we can all help them.

Caren Loebel-Fried is an award-winning author and artist from Volcano, Hawai'i. Birds, conservation, and the natural world are the foundations for her work. Caren has created nine storybooks to date, including "*A Perfect Day for an Albatross*", "*Manu, the Boy Who Loved Birds*", and "*Hawaiian Legends of the Guardian Spirits*", and has worked with teachers to create educational guides for her books for schools and at-home learning. Caren's books have received the American Folklore Society's Aesop Prize for Children's Folklore, the Moonbeam Children's Book Awards, and the Hawai'i Book Publishers Association's Ka Palapala Po'okela Awards for Excellence. Her commissions for iconic and educational art include the U.S. Fish and Wildlife Service, Midway Atoll National Wildlife Refuge, Kīlauea Point Natural History Association, Conservation Council for Hawai'i, Friends of Hanauma Bay, and private collectors. Art from her latest book, "*Finding Home, A Hawaiian Petrel's Journey*", was acquired by the Hawai'i State Foundation on Culture and the Arts for their "Art in Public Places" program. Caren's love of seabirds is fueled by fieldwork on Midway Atoll with the albatross census team, and research of the 'ua'u, Hawaiian petrel, and other seabirds on their breeding grounds throughout the Hawaiian Islands. With art and stories, Caren aims to bring science to communities and people of all ages, in the hope that when people make connections to wildlife and the natural world, they will want to help care for it.

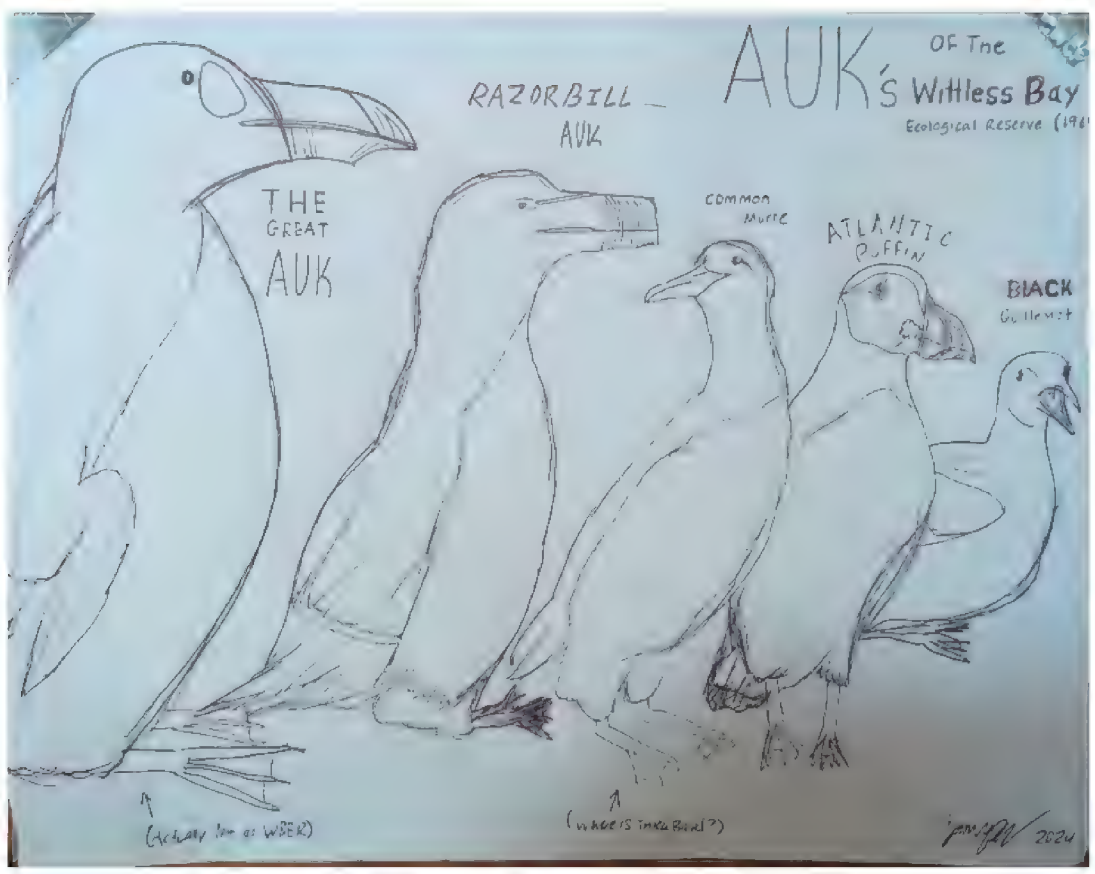
Published by University of Hawai'i Press, "*Finding Home, a Hawaiian Petrel's Journey*" is a 120-page hardback with full-color illustrations throughout and retails for $19.99. Books will be generally available at book retailers nationwide or can be ordered directly from

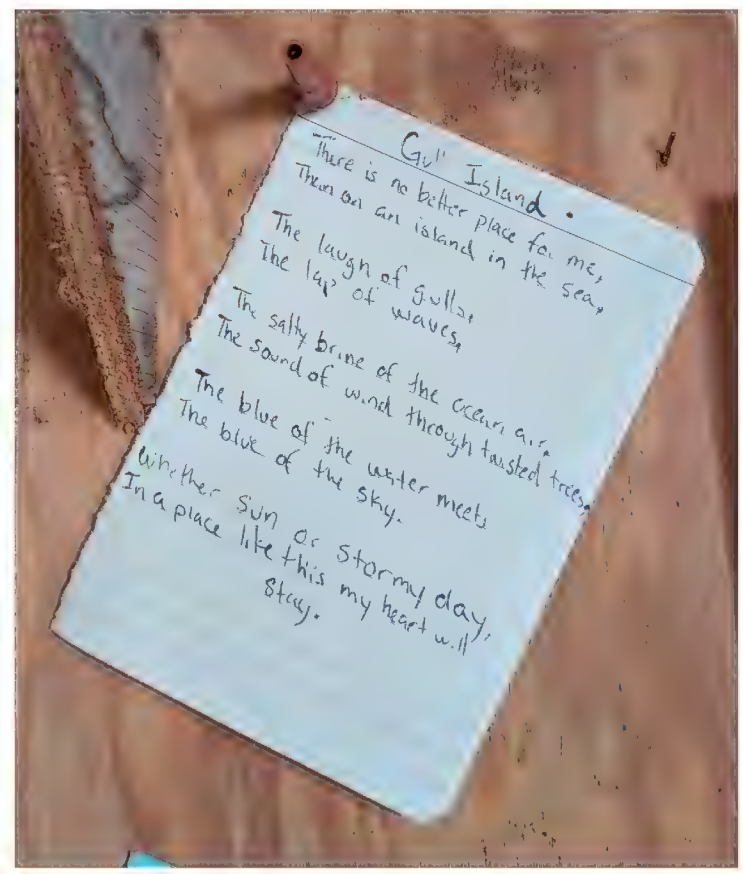
University of Hawai‘i Press: 2840 Kolowalu Street, Honolulu, HI 96822 by email (uhpbooks@hawaii.edu) or online (https://uhpress.hawaii.edu/).

Art on the cabin walls: Gull Island, Witless Bay Ecological Reserve

By Johanna-Lisa Bosch, Wildlife Research Division, Environment and Climate Change Canada (johannalisa.bosch@ec.gc.ca)

On Gull Island, nestled within the Witless Bay Ecological Reserve in Newfoundland, stands a small cabin that has welcomed countless researchers and students over the years. Owned by the province and used by Environment Canada's Wildlife Research Division, this cabin serves as more than just a hub for critical seabird research during the summer nesting season. It has also become home to a growing collection of artwork, capturing the spirit and beauty of the island.



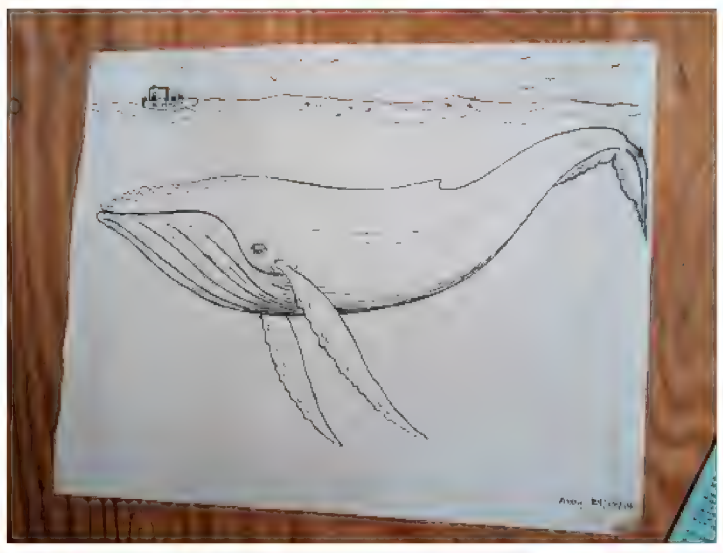


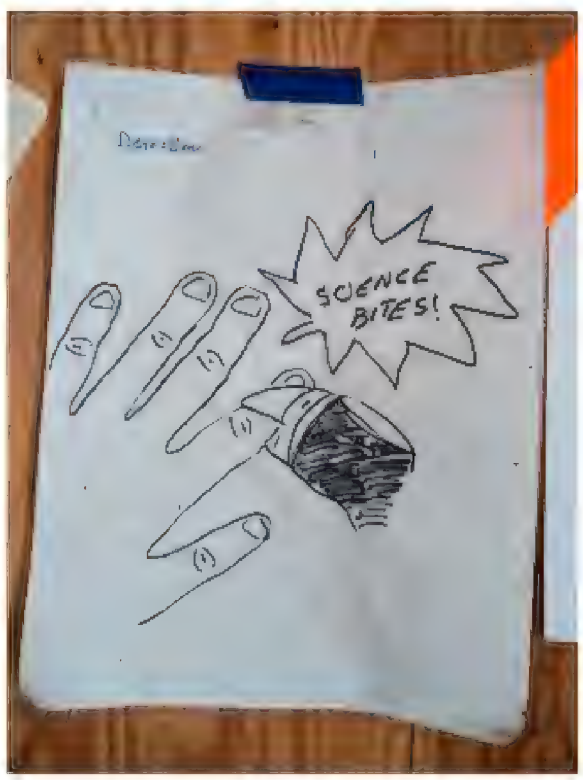
The cabin walls are covered with sketches, poems, and drawings, most of them left behind by students from Memorial University or visiting researchers. These pieces range from detailed bird portraits to fun, quirky cartoons that capture life on the island.

The common theme? A love for the seabirds that call this place home, like the Leach's Storm Petrels, Common Murres, Atlantic Puffins, and the various gulls that nest nearby.

This ever-evolving gallery adds a personal touch to the cabin, making it feel more like a home rather than just a place to crash after a long day in the field. Each piece of art tells a story, a snapshot of the time someone spent on the island, blending science with creativity in a way that's both unique and special. It's a reminder that even in the midst of research, there's always room for a little inspiration!


I'm just a teenage dirtbag
BABY




SCIENCE BITES!


2024

Tākoketai/Black Petrels (*Procellaria parkinsoni*) on Aotea/Great Barrier Island, Aotearoa New Zealand

By Elizabeth Bell, Wildlife Management International Ltd, PO Box 607, Blenheim, New Zealand (biz@wmil.co.nz, www.wmil.co.nz)

The author with a tāoketai/Black Petrel in May 2020. Image credit: Paul Garner-Richards, WMIL.

The tāoketai or Black Petrel (*Procellaria parkinsoni*), almost completely black with a pale yellowish, black-tipped bill, is an endemic Aotearoa New Zealand seabird. They once bred throughout the Te Ika-a-Māui/North Island and top of Te Waipounamu/South Island, but due to mammalian predators and habitat loss, are now only found on Aotea/Great Barrier Island and Te Hauturu-o-Toi/Little Barrier Island. Weighing on average 700 g, tākoketai have a 1.1 m wingspan adapted for soaring effortlessly at sea.

Wildlife Management International Ltd (WMIL), along with assistants and collaborators, have been studying these amazing birds since 1995 for Ngāti Rehua and the Department of Conservation. On Aotea, tākoketai are affected by habitat loss and predation by rats, feral cats and feral pigs, and at-sea by commercial and recreational fishing, climate change and pollution events. WMIL has been working at the main colony around the summit Hirakimata/Mt Hobson, monitoring 482 study burrows within the 35-ha study site each breeding season. This work can involve incredible gymnastics, putting one arm down into a burrow while trying not to slide down banks, lying over and under trees or rocks and being very tolerant of painful bites and scratches. All birds handled each season are banded with an individually numbered metal band so they can be identified, and their breeding history followed from year to year. Over 3,000 adults and over 5,000 chicks have been banded over the 29-year study to date.

Tākoketai have always been on Aotea with their current range mainly restricted to high ridges and mountains. They are nocturnal on land, returning to Aotea between dusk and dawn. As most birds breed in the dense forest around Hirakimata, they just crash down through the trees when arriving, collapsing their wings and hitting the canopy with a loud crunch. It can be very odd to be sitting in the dark hearing one crash land in the canopy, wriggle through the foliage and flop to the ground, usually less than a metre away from the entrance to its burrow. When leaving, tākoketai either climb a tree, or scale a protruding rock or other high point such as the summit platform – spreading their wings to feel the air and then launch themselves off, leaping into the sky, soaring off to sea.

The only time that tākoketai spend on land is during their breeding period; there are an estimated 5,000 breeding pairs worldwide, with most on Aotea. Tākoketai return every October. Males return first to the burrows to prepare it for the year's breeding effort by gardening outside the entrance and building a nest inside the chamber. Pairs generally use the same burrow throughout their whole breeding lives—up to 40 years.

Females head directly to their burrow following the far-carrying male "clacking" calls, sometimes calling in response from the air. They renew their relationship, strengthen their pair bond, mate, and then depart for their "honeymoon". The females grow the egg at this stage returning between late November and late December to lay a single egg. If this egg fails, tākoketai do not re-lay that year. Both adults share the responsibility of incubating the egg for nearly two months (on average 57 days). Through various tracking and logger work at Aotea, data shows that tākoketai head to the northern waters off Aotearoa, the eastern offshore waters of Australia and into the southern Pacific to forage, generally diving around 10 metres, although capable of reaching 34 metres, after fish and squid. Tākoketai also feed in association with whales and dolphins, as well as scavenging behind fishing boats. Each year the WMIL research team are joined at the colony by commercial fishermen, where we teach them about tākoketai and how precious they are – pushing the fishers into the burrows and laughing unsympathetically as they experience the sharp bills and claws despite the thick leather gloves, but also watching them fall in love with tākoketai and becoming their champions. One year, a fisher said that everyone should have the chance to see these birds.

When 3 people are needed to get a tāoketai/Black Petrel out of a burrow. Image credit: Biz Bell, WMIL.

Chicks hatch from late January, with fuzzy "afro" hairstyles, loud "honking" calls and attempting to bite when they are checked, often harder than expected. Handled delicately like over-filled water-balloons waiting to burst, chicks grow quickly; by 10 days old they can be left unguarded in the burrow while both parents go to sea for food, returning every two to three nights to feed the hungry chick. It takes over 100 days for chicks to reach fledging condition. Towards the end of the breeding season, the research team band all surviving chicks before they fledge sometime between May and June. These chicks learn how to fish for themselves and make their first overseas adventure through the Pacific to coastal waters off South America. Watching chicks walk to a prominent "launch rock" and clamber up with their wings spread out using their claws and bills to manoeuvre up the rock face and jump off on their first flight to South America is magic. Years of tākoketai using these rocks have left their mark with deep grooves scratched into the rock faces.

During the 2023/24 breeding season, 63.5% of the study burrows were occupied by breeding pairs, 12% occupied by non-breeding birds, and 24.5% were unoccupied during

our visits (with over 50% of those unoccupied burrows showing no evidence of activity at all, i.e., blocked up, no feathers, scent of guano, etc.). Overall, 222 chicks were produced from the study burrows representing a fledgling success rate of 72.5%.

Tāoketai/Black Petrel, Mt. Hobson. Image credit: Dave Boyle, WMIL.

Tāoketai/Black Petrel family in a burrow in January 2020. Image credit: Ed Marshall.

When the adults finally depart after their chick fledges, they also head to waters off South America to feed on the Humboldt Current's rich resources, spending this time recovering from one busy year and preparing for the next. Chicks remain in these overseas coastal waters for two to three years before returning to start raising chicks of their own. To date WMIL has only recaptured less than 10% of all fledged chicks back at Aotea. Understanding the factors affecting return rates of chicks within the 35-ha study site is vital. It is important to determine whether it is related to low juvenile survival or if it is simply due to a lack of detection. Understanding juvenile survival and recruitment is necessary for accurate demographic modelling and for species risk assessment modelling

and we will be continuing to obtain this data with urgency. WMIL plan to monitor these amazing birds for years to come and continue to learn as much as we can about tākoketai.

Insights into the year-round behaviour of common murres at breeding sites

By Sophie Bennett, British Trust for Ornithology (BTO), The Nunnery, Thetford, Norfolk, IP24 2PU (sophie.bennett@bto.org)

The year-round cycle of the behaviour of many seabird species is clear and consistent: birds breed at large mixed colonies in the breeding season, rear their chicks, and then depart to the sea until the next breeding season. Common murres, *Uria aalge* hereafter "murres", are generally accepted as having this typical behaviour cycle. However, it is becoming apparent that individuals at several populations at the southern extent of the species' range return to occupy breeding sites outside of the breeding season (Figure 1; Boekelheide et al., 1990; Harris, 1984; Sinclair, 2018). On the Isle of May, Scotland, birds may return from autumn onwards for varying periods of time, generally arriving just after dawn (Harris & Wanless, 1989; Harris & Wanless, 2016). There are also numerous additional anecdotal accounts of murres occupying sites in the nonbreeding season in populations around the United Kingdom (UK) including in the UK's largest murre colony, Rathlin Island (Northern Ireland), as well as in colonies in the North of England and off the Welsh Coast (James Crymble and Linda McKenzie pers. comms.) and further afield on the Farallon Islands (California; Boekelheide et al., 1990). It is likely that this behaviour also occurs at other colonies but has not been formally recorded.

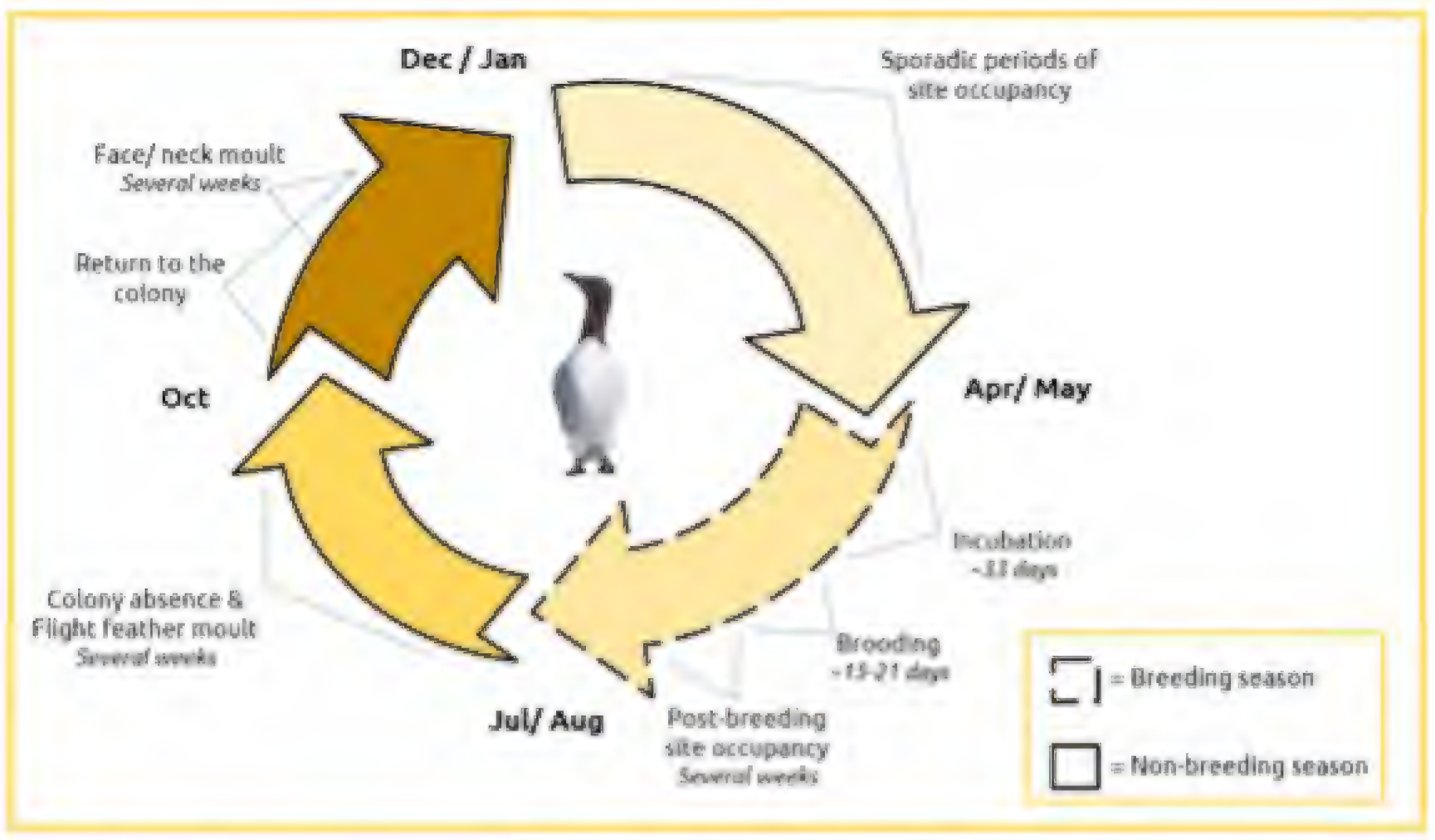


Figure 1. Key stages in the annual cycle of murres (timings as per birds breeding on the Isle of May, Scotland).

However, how often murres come back to the colony in the non-breeding season, why they do this, if they benefit, or if they suffer costs from this behaviour has, until very recently, been unknown. We know that in other bird species, more time spent in site defence during the breeding season can result in individuals obtaining or retaining a more desirable breeding site and breeding more successfully (Morales et al., 2014). Further, the occupancy of breeding sites in the non-breeding season can relate to fitness; sites that were previously successful were occupied more frequently in early autumn and may subsequently be more successful (Harris & Wanless, 1989). Consequently, given the territorial nature of murres, the securing of a desirable breeding site and associated fitness benefits have been suggested as possible motivations for this behaviour.

To investigate why birds return to their breeding sites over winter, and investing so much time in doing so, we set out to test how site occupancy in the non-breeding season related to site quality, breeding timing, and breeding success of murres on the Isle of May in Scotland. Using time-lapse photography, we recorded occupancy at breeding sites from October to March over three consecutive non-breeding seasons. We then monitored the successive breeding timing (lay date) and breeding success at each site to investigate how the occupancy behaviour may relate to future fitness measures.

We found that, on average, sites were first occupied in late October (c. 3 months after departing the colony in the breeding season). Sites were thereafter occupied on 46 ± 18% of days in the non-breeding season and for 55 ± 15% of the time. This degree of intensity of site occupancy behaviour was completely unprecedented and indicated a huge investment in both time and energy to be present at sites.

Higher-quality sites, sites with higher average historic breeding success, were occupied earlier, more frequently and for longer daily durations (Figure 2). Laying was also earlier at sites that were occupied more frequently, and sites occupied earlier were more successful, supporting the idea that individuals were returning to the colony to obtain and defend breeding sites.

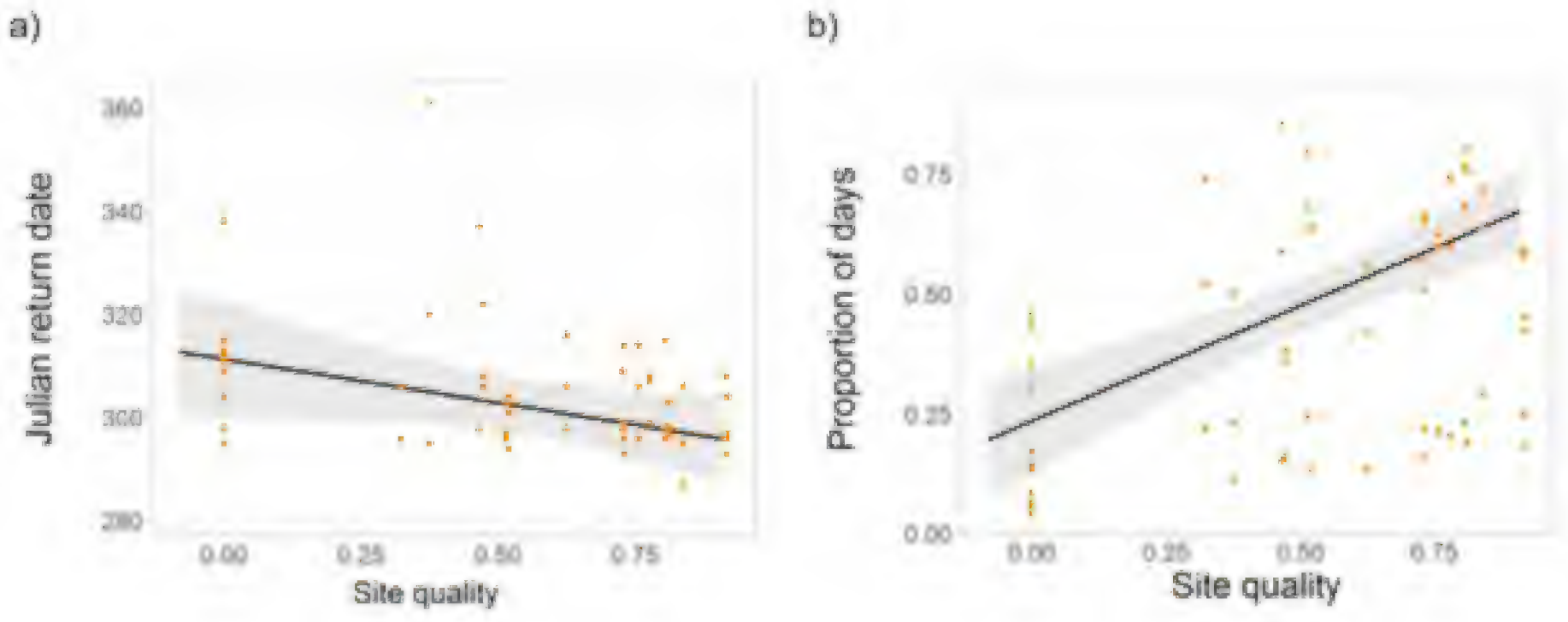


Figure 2. Relationship between a breeding site's quality and (a) return date, (b) the proportion of days that a site was occupied. Raw data (points) and GLMM model predictions (fitted line ± 95% CI). *N* = 59. Adapted from Bennett et al. (2022).

It was surprising however that there was such variation between sites in investment in occupancy behaviour, despite clear benefits. To investigate this further we next considered that occupancy may also have net negative consequences for murres. For example, increased time in occupancy for murres may result in more time in flight commuting between the colony and foraging grounds and less time for foraging and resting. Flight is particularly energetically costly in murres resulting from their high wing-loading (Thaxter et al., 2010). Occupancy may then indirectly increase the energetic expenditure of individuals that could ultimately affect fitness. How individuals may be able to optimise occupancy to buffer against costs and take advantage of such benefits may have further consequences for population level fitness.

To address this next stage of investigation into this fascinating behaviour, we investigated how non-breeding occupancy of breeding sites is related to at-sea distribution, and how much energy and time individuals allocate to behaviours throughout the non-breeding season. We used bird-borne geolocators and time-depth recorders to record distribution and estimate time allocated to behaviours including occupancy, flight and foraging.

Firstly, we demonstrated that individuals were very variable in their occupancy behaviour (Figure 3).

Figure 3. Individual daily occupancy patterns of presence, "1", and absence, "0", across one example non- breeding seasons from the earliest return date after moult of any bird (1 October). "Average" is the mean occupancy pattern across individuals in each non-breeding season. White spaces indicate days with no data due to logger malfunction. Grey spaces indicate periods prior to an individual being fitted with a geolocator within a season. Adapted from Bennett et al. (2024).

Individuals that remained nearer to the colony before their first return then returned earlier and had shorter bouts of absence thereafter. Crucially, when investigating why all individuals did not equally allocate effort into occupying sites, we found individuals also experienced a trade-off in the time and energy spent in occupancy or foraging. This trade-off indicated that an individual's ability to forage efficiently may affect their ability to undertake occupancy (Figure 4).

Overall, we showed that occupancy is important for murres, returning earlier and occupying more often results in obtaining a better breeding site, and breeding more successfully. However, individuals differ in their ability to undertake occupancy likely mediated by variation in foraging efficiency, a measure of individual quality. Given that this behaviour can be hugely beneficial for the birds, it will be an important component of their annual cycle. This means we should start considering this behaviour when exploring the population demography and behaviour of this species.

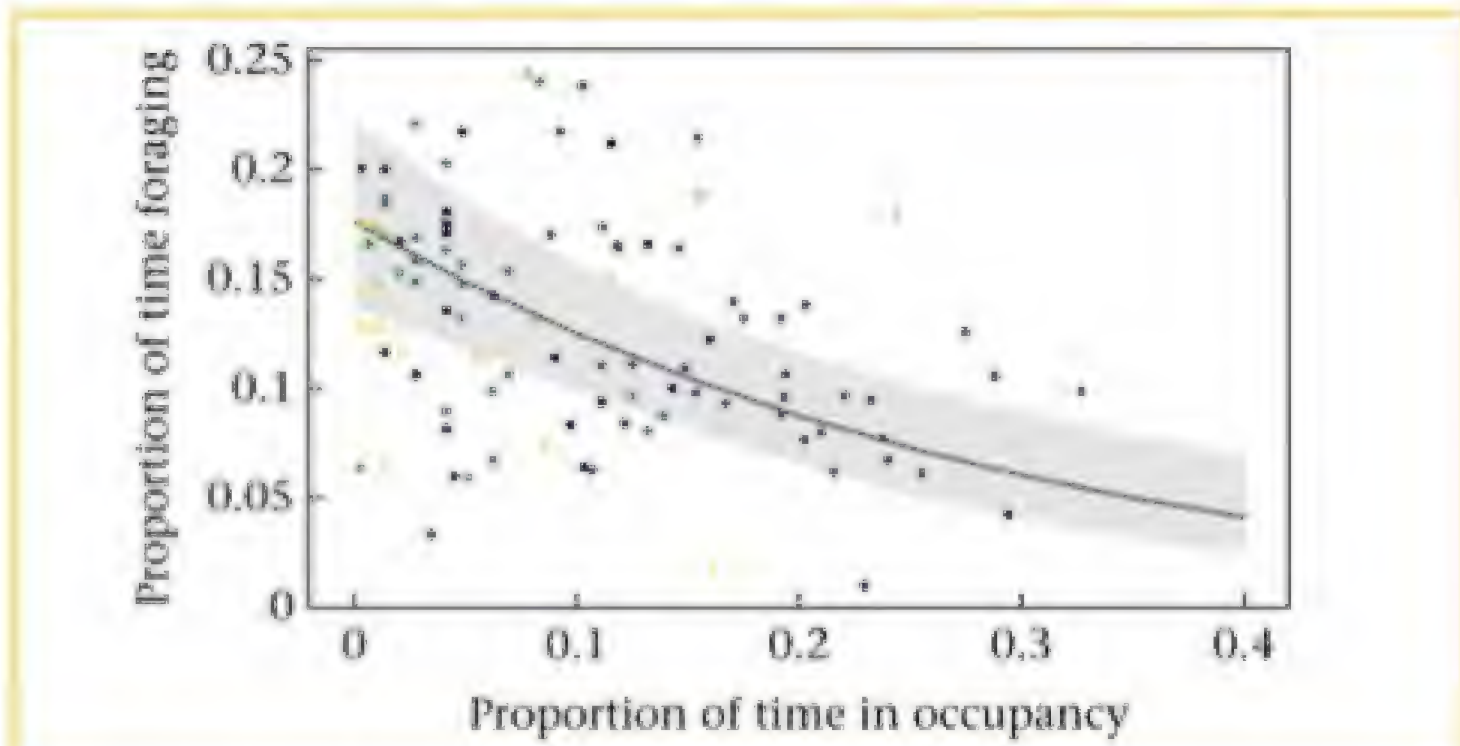


Figure 4. The proportion of daily time spent foraging in relation to the proportion of daily time spent occupying the colony in the non-breeding season. Colours indicate individual ID. GLMM predictions ± 95% confidence intervals are indicate by a fitted line and shaded area, respectively. *N* = 97 observations and 7 individuals. Adapted from Bennett et al. (2024).

While through this work we have greatly improved understanding of this behaviour, there is still much for us to learn of course to fully comprehend how this behaviour, and any variation therein, may affect population fitness, not limited to: How does this behaviour vary between years in response to environmental conditions? What are the consequences of this behaviour not occurring?

We're also keen to hear about this behaviour at other colonies and to collaborate on exploring the variation in and drivers of this behaviour more—do get in touch if you'd like to contribute on this.

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Tracking seabird colonies through paleolimnology

By Johanna Bosch, Wildlife Research Division, Environment and Climate Change Canada (johannalisa.bosch@ec.gc.ca)

Paleolimnology, the study of ancient pond and lake sediments, has proven to be an invaluable tool in monitoring seabird colonies over long periods. By studying the sediment layers in freshwater ponds adjacent to nesting sites, paleolimnologists can uncover critical information about the influence of seabird guano on the surrounding ecosystem (Figure 1).

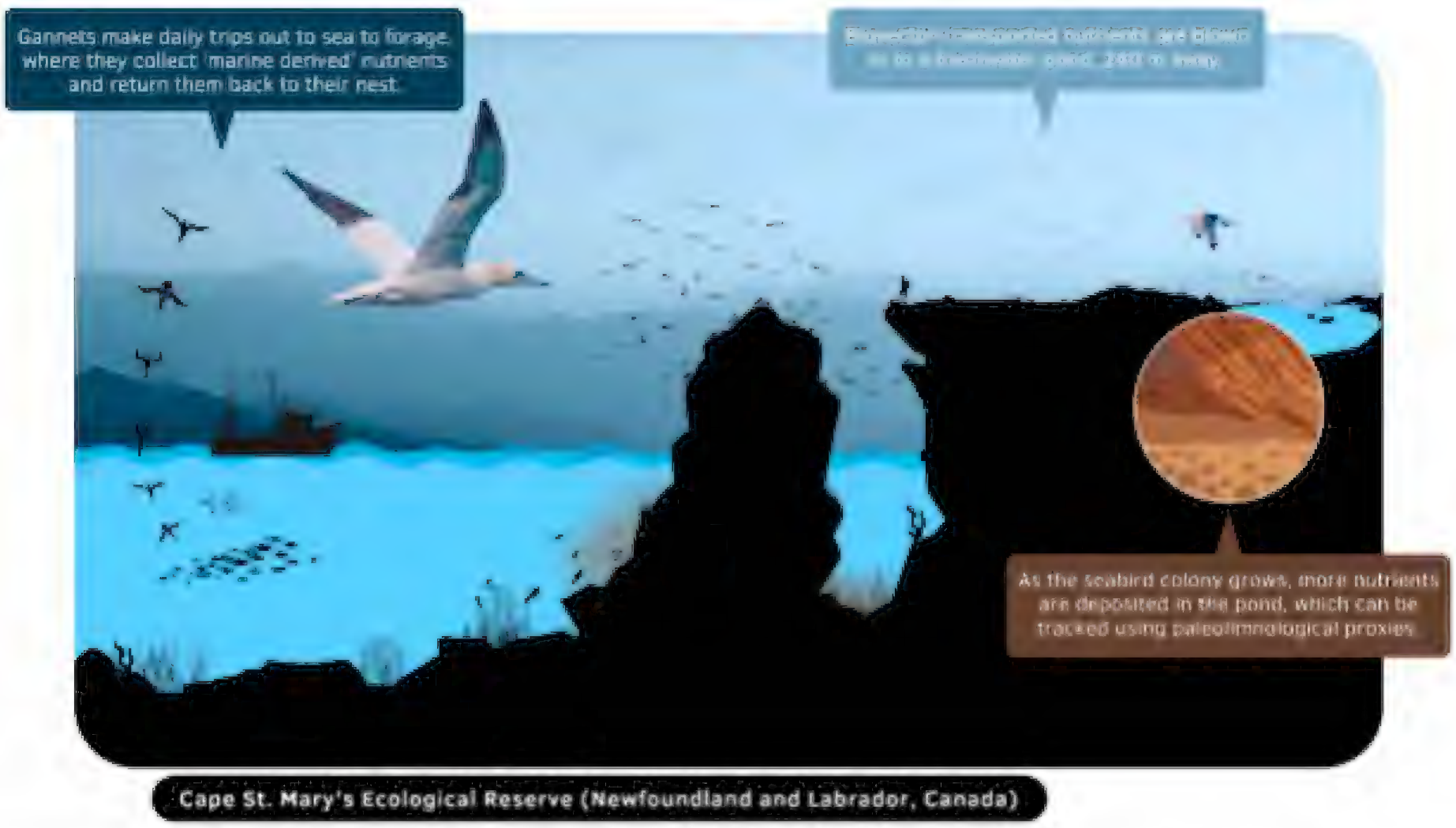

Figure 1. From Bosch J *et al.* 2023, Seabird nutrient transfer from Bird Rock, in Cape St. Mary's Ecological Reserve (Newfoundland and Labrador, Canada), to a pond 240 m away from the seabird colony. Seen in the illustration are Northern Gannets (*Morus bassanus*) and Black-legged Kittiwakes (*Rissa tridactyla*), which both nest within the reserve on an annual basis. Created using Canva illustrations and graphics.

This method allows researchers to go beyond the limitations of historical records and modern census data, providing a detailed look at how seabird populations have fluctuated over centuries. Seabird guano, rich in nutrients such as nitrogen, phosphorus, and trace metals, alters the chemistry and biology of surrounding environments, including any nearby water bodies. Key indicators like nitrogen isotopes, trace metals (Zn, Cd), and diatom species have served as proxies for seabird presence and colony size.

We applied this technique to track the establishment and rapid growth of the northern gannet colony at Cape St. Mary's (CSM) Ecological Reserve, in Newfoundland and Labrador. For this study, we carefully extracted sediment core from a pond bed near the colony, and then sectioned the core on-site (Figure 2). Once the sectioned core was freeze dried, a precise chronology of the core was obtained using lead (Pb-210) dating. We then analyzed various geochemical and biological shifts occurring in the core over time, known to be related to ornithogenic presence, including δ15N isotopes, levels of cadmium, zinc and phosphorus, as well as primary production and dominant diatom assemblages.

Figure 2. Collecting and processing a core from Cape St. Mary's Ecological Reserve, in Newfoundland (Canada): (a) a core collected from a pond using a Glew & Smol push corer; (b) a sediment core placed in the Glew extruder prior to sectioning; (c) sectioning the sediment core by quarter-centimeter intervals using a spatula; (d) a sectioned and freeze-dried sediment core.

We found that our proxy data aligned closely with historical records for gannets nesting in CSM, showing notable colony expansion throughout the 20th century. Through our paleolimnological data, we could see how the colony developed from relatively small beginnings into the large, thriving population observed today. This work illustrates the power of combining paleolimnological data with modern population records to reconstruct seabird dynamics, offering insights into past ecosystem changes and informing future conservation efforts. Our findings were recently published in Scientific Reports, where we demonstrate how paleolimnological reconstructions can validate

historical seabird population data, and highlight the resilience of the Northern Gannets of Atlantic Canada in the face of stressors such as human disturbance, changing ocean conditions, and disease outbreaks, including the recent avian influenza outbreak. You can read the paper here:

Bosch, JL., Álvarez-Manzaneda, I., Smol, J.P. et al. Blending census and paleolimnological data allows for tracking the establishment and growth of a major gannet colony over several centuries. Sci Rep 14, 20462 (2024). https://doi.org/10.1038/s41598-024-69860-z

Hawai‘i Wildlife Center (HWC) rehabilitation patients

By Linda Elliott, Hawaii Wildlife Center, P.O. Box 551752, Kapa‘au, HI 96755 (linda@hawaiiwildlifecenter.org)

Hawaiian archipelago seabird and shorebird rehabilitation patients treated at Hawaii Wildlife Center (HWC) March 1, 2024 to August 31, 2024 consisted of 170 seabirds (16 species) and 9 (2 species) shorebirds.

- Seabird species are listed in order of largest number cared for to lowest:
    - White-tern (*Gygis alba*) (Manu o Kū): 80
        - Most of the terns are orphaned chicks that are raised and soft-released
    - Wedge-tailed Shearwater (*Ardenna pacifica*) (‘Ua‘u kani): 53
        - The majority of these shearwaters were downed fledglings due to light polution or impact with structures
    - Sooty Tern (*Sterna fuscata*) (‘Ewa ‘ewa): 9
    - Red-footed Booby (*Sula sula*) (‘Ā): 5
    - Brown Noddy (*Anous stolidus*) (Noio kōhā): 4
    - Brown Booby (*Sula leucogaster plotus*) (‘Ā): 3
    - Masked Booby (*Sula dactylatra*) (‘Ā): 2
    - Red-tailed Tropicbird (*Phaethon rubricauda*) (Koa‘e ‘ula): 2
    - Nazca Booby (*Sula granti*) (‘Ā): 2
    - Christmas Shearwater (*Puffinus nativitatis*) (‘Ao‘ū): 2
    - Newell’s Shearwater (*Puffinus auricularis newelli*) (‘A‘o): 2
    - Sooty Shearwater (*Ardenna grisea*): 2
    - Bulwer‘s Petrel (*Bulweria bulwerii*) (‘Ou): 1
        - Majority are downed fledglings with short stays in care
    - Hawaiian Petrel (*Pterodroma sandwichensis*) (‘Ua‘u): 1

    - Leach's Storm-Petrel (*Oceanodroma leucorhoa leucorhoa*): 1
    - White-tailed Tropicbird (*Phaethon lepturus*) (Koa'e kea): 1
- Shorebirds:
    - Pacific Golden Plover (*Pluvialis fulva*) (Kōlea): 8
    - Bristle-thighed Curlew (*Numenius tahitiensis*) (Kioea): 1

Ten years of monitoring endangered ʻuaʻu in protected reserves on east Maui

By Jenni Learned (learnedj@hawaii.edu) and Jay Penniman (jayfp@hawaii.edu)

Before humans were established in the Hawaiian archipelago, ʻuaʻu (*Pterodroma sandwichensis*; Hawaiian Petrel) were among the most numerous of bird species in the islands (1). Today, remnant breeding populations are restricted to remote and primarily high elevation habitats. Various conservation agencies manage breeding assemblages on Kauaʻi, Lānaʻi, Maui, and Hawaiʻi islands. Acoustic monitoring has detected ʻuaʻu on Oʻahu and Molokai; however, breeding burrows have yet to be identified (2). The largest remaining population of ʻuaʻu exists on Maui within the summit district of Haleakalā National Park and expands into neighboring parcels on leeward and windward slopes. At the Maui Nui Seabird Recovery Project (MNSRP), we monitor and protect ʻuaʻu in the upper Nakula Natural Area Reserve and Kahikinui Forest Reserve on the leeward slopes of Haleakalā.

Haleakalā is a massive dormant volcano and the dominant topographical feature of east Maui. On the arid leeward slopes, habitat ranges from alpine rockland above 2400 meters to subalpine shrubland, grassland, and tropical dry forest at lower elevations. Surficial geology is primarily rocky with intermittent cinder fields. The average grade is around 30% and the slope is transected by steep-sided gulches. Despite the rugged topography and harsh environmental conditions, introduced mammalian predators (cats, mongooses, rodents, and pigs) are widespread and pose a significant threat to indigenous avifauna and bats. Introduced grazing mammals including cattle, goats, and deer cause severe habitat degradation and landscape alteration. To counteract these threats, Haleakalā National Park maintains programs to remove predators and to protect and restore habitat (3). Outside of the park, partnership agencies like MNSRP adopt similar methodology with the goal of recovering ʻuaʻu across the historic range. Hawaiʻi State Division of Forestry and Wildlife (DOFAW) completed ungulate exclusionary fencing around Nakula and Kahikinui reserves and began removing feral ungulates in 2014. MNSRP works within the fenced reserves above 2070 meters, an area of approximately 530 hectares (Figure 1).

Figure 1. Haleakalā National Park and neighboring reserves in East Maui. The blue line in Nakula and Kahikinui reserves represents the lower ungulate exclusionary fence.

ʻUaʻu are burrow-nesting procellariform seabirds that raise their single chick during the summer months. MNSRP monitors each identified burrow throughout the breeding season, visiting at least once per month to document activity signs (guano, feathers, collected vegetation/nest material, odor, tracks, digging) and to track entrance/egress from burrows using toothpicks erected across the entrance (Figure 2). As resources allow, we deploy motion-activated game cameras at select active burrows. Game camera data provide a complete record of ʻuaʻu activity, including timing of adult attendance, nest maintenance and other pair activities, and chick emergence and fledge date (Figure 3). Camera data also reveal predator and feral goat activity. In addition to small-mammal kill traps established across the sites, we use the camera data to deploy traps responsively to predator detections at burrows. At the conclusion of the breeding season, burrows are categorized based on status (breeding or non-breeding, if breeding; successful or failed) to estimate reproductive success. Annual phenology and reproductive success data, as well as predator detection and capture data are stored in the long-term database for the Haleakalā ʻuaʻu population.

Figure 2. Typical ʻuaʻu burrow in Nakula/Kahikinui with toothpicks erected for monitoring.

Figure 3. Young ʻuaʻu chick captured on game camera emerging from its burrow.

Ungulate exclusion and predator management in Nakula and Kahikinui positively impact ʻuaʻu on leeward Haleakalā. Following the completion of the fence in 2014, a thorough search of ideal habitat produced only eight active ʻuaʻu burrows. MNSRP continues to perform standardized burrow searching every year in July. After 10 years of site protection and management, the ʻuaʻu burrow count has increased to 115. On average, ʻuaʻu are establishing new burrows at a rate of 11 burrows annually. The reproductive success rate, at 0% and 14% in 2014 and 2015, now averages 48% (Figure 4).

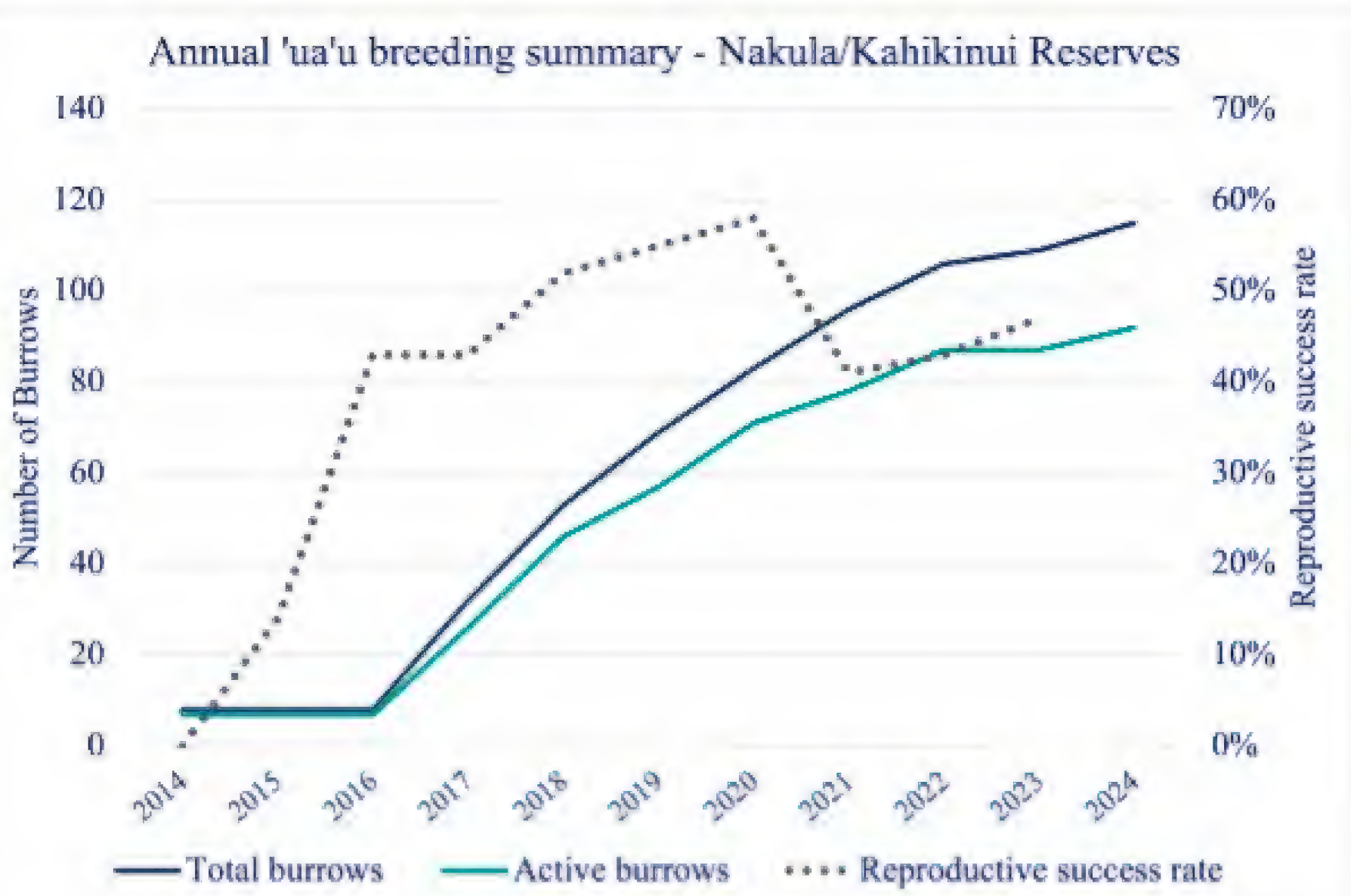

Figure 4. Annual counts of total and active ʻuaʻu burrows (2014–2024) and reproductive success (2014–2023). The 2024 breeding season is ongoing at the time of this report.

In addition to observation data, MNSRP uses tools to assess ʻuaʻu population trends indirectly. Every three years, we deploy automated acoustic monitors (AAM) for the duration of the breeding season at 19 established sites. The acoustic data reveal spatiotemporal changes in ʻuaʻu activity across leeward Haleakalā since 2014. Bayesian analyses show a 20% annual increase in ʻuaʻu calling activity (4). More specifically, these data indicate a proportionally greater rate of increase at lower elevations, suggesting that the ʻuaʻu population could be expanding outward from the denser aggregations within

Haleakalā National Park. Furthermore, in the summer of 2021, we initiated annual ornithological radar surveys at 16 sites around Maui replicating a pilot survey conducted in 2001 (5). Several sites are located downslope from the Haleakalā ʻuaʻu population, where adults can be detected as they return to their breeding burrows after sunset. While it is too early to draw precise conclusions from the long-term study, the data suggest stable if not increasing passage rates for ʻuaʻu transiting to Haleakalā.

Seabirds tend to have long lifespans, low reproductive output, and cryptic habits. They continuously adapt to changing environmental conditions impacting their marine foraging grounds and their terrestrial habitats. All of these factors make it necessary to maintain consistent long term monitoring records to assess population trends and response to management. For the ʻuaʻu on Haleakalā, early interpretation of a long-term data set suggests that dedicated work against the threats imposed by introduced species is having a positive effect. There is no doubt that protective management activities within Haleakalā National Park, ongoing for almost 50 years, have saved the Maui ʻuaʻu population from precipitous decline. The combined efforts of partnership agencies in recent decades support recovery and population growth. In just 10 years, ʻuaʻu have shown a clear and positive response to efforts in Nakula and Kahikinui. With seabirds suffering declines globally, we are hopeful that this report serves as an optimistic reference for seabird restoration across Hawaiʻi and beyond.

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The impact of light attraction on adult seabirds and the effectiveness of minimization actions

By Andre Raine, Archipelago Research and Conservation LLC, Kauaʻi, HI (andreraine@arckauai.com)

Light attraction is a well–documented phenomenon affecting seabirds worldwide, but it is typically associated with fledglings taking their first flight out to sea. Indeed, the island of Kauaʻi (the northern-most of the main Hawaiian Islands) is one of the better-known examples of this conservation issue, with large numbers of fledgling ʻaʻo (Newell's Shearwaters, *Puffinus newelli*, an endangered endemic seabird) grounded every year. While multiple scientific papers have considered fledgling fallout, there is little in the literature regarding the impact of light attraction on breeding adult seabirds on land. In our paper, published in volume 78 of the journal Pacific Science, we address this issue by documenting a large-scale fallout event of adult seabirds at a facility in the northwest of the island.

During this unprecedented event in September of 2015, 131 endangered adult seabirds, including 123 ʻaʻo and six ʻuaʻu (Hawaiian Petrels; *Pterodroma sandwichensis*), were grounded by lights at the Kōkeʻe Air Force Station (KAFS)—the majority occurring over a two-night period. This was caused by the bright, upward–facing, unshielded lights utilized at the facility coupled with conditions that exacerbate the fallout phenomena—a waning moon (and thus a dark night), with rain and fog. By comparison, in the whole of 2015 leading up to this event, the Save Our Shearwaters program (the island's rescue and rehabilitation program) recovered a total of five adult ʻaʻo across the island, of which at least three were downed because of powerline collisions. The fallout event at KAFS therefore equated to 98.5% of all adults grounded due to light attraction on Kauaʻi in that year.

Grounded 'a'o (Newell's Shearwater) often crawled into very small dark spaces and were only found by dedicated searchers using flashlights. Image credit: Andre Raine.

In response to this event, the facility altered its lighting protocol with a blackout period in effect for the remainder of 2015, and a new lighting regime which, from 2017 onwards, consisted of shielded low–intensity light bollards that were only turned on when AFS staff required them. Following the fallout event we carried out an intensive annual seabird monitoring project at the facility, using a combination of nocturnal surveys with night vision, acoustic recorders, remote cameras and ground searches. Apart from two ‘a‘o adults grounded in 2016 (before the lights were turned off at the start of the seabird season) and one each in 2020 and 2023, no additional grounded birds were found indicating that the new lighting regime was successful in dramatically reducing fallout.

Left: Lights at the facility during the fallout were bright green, unshielded and often upwards facing. Right: Lights after minimization were significantly reduced, consisting of bollards emitting a low wattage amber glow (590mm, 33 watts). Image credits: Andre Raine.

This event also highlighted the issues with assessing the magnitude of grounded seabirds at facilities, an important factor in ongoing Habitat Conservation Plans for endangered seabirds on the island. This is because when grounded, birds will invariably try to hide and can be very difficult to locate. When birds are not being actively and regularly searched for by trained observers, they may move into dark crawl spaces or dense vegetation and evade detection. For example, when trained observers searched the facility for grounded seabirds immediately prior to nightfall on the 9th and 10th of September 2015, they found 43 additional individuals which were missed by facility staff conducting their normal work duties on the previous nights. Many of these birds were only found because searchers lay prone on wet ground to look into very small dark crawl spaces with flashlights or crawled into difficult spaces to look for birds. Searcher efficiency is an important facet of understanding the magnitude of seabird fallout, and unless trained observers knowledgeable with the target species diligently search areas for downed birds at appropriate times, then the number of seabirds reported at any facility where fallout is an issue may considerably underestimate the scale of the problem.

This fallout event demonstrated that light attraction can be a significant hazard for adult seabirds if bright lights are present near breeding colonies. The Kōkeʻe AFS is in close proximity to some of the largest colonies of ʻaʻo and ʻuaʻu in the world, with the closest colonies less than a kilometer away. Conversely, every year adult ʻaʻo and ʻuaʻu pass in large numbers over brightly lit coastal towns on their way to inland breeding colonies without light attraction issues. The glow from these areas is significantly brighter than the lights at the KAFS (from our light assessment, lights in Līhuʻe were up to 12.3 times brighter than those at KAFS during the fallout event) but does not result in large numbers of grounded adult birds.

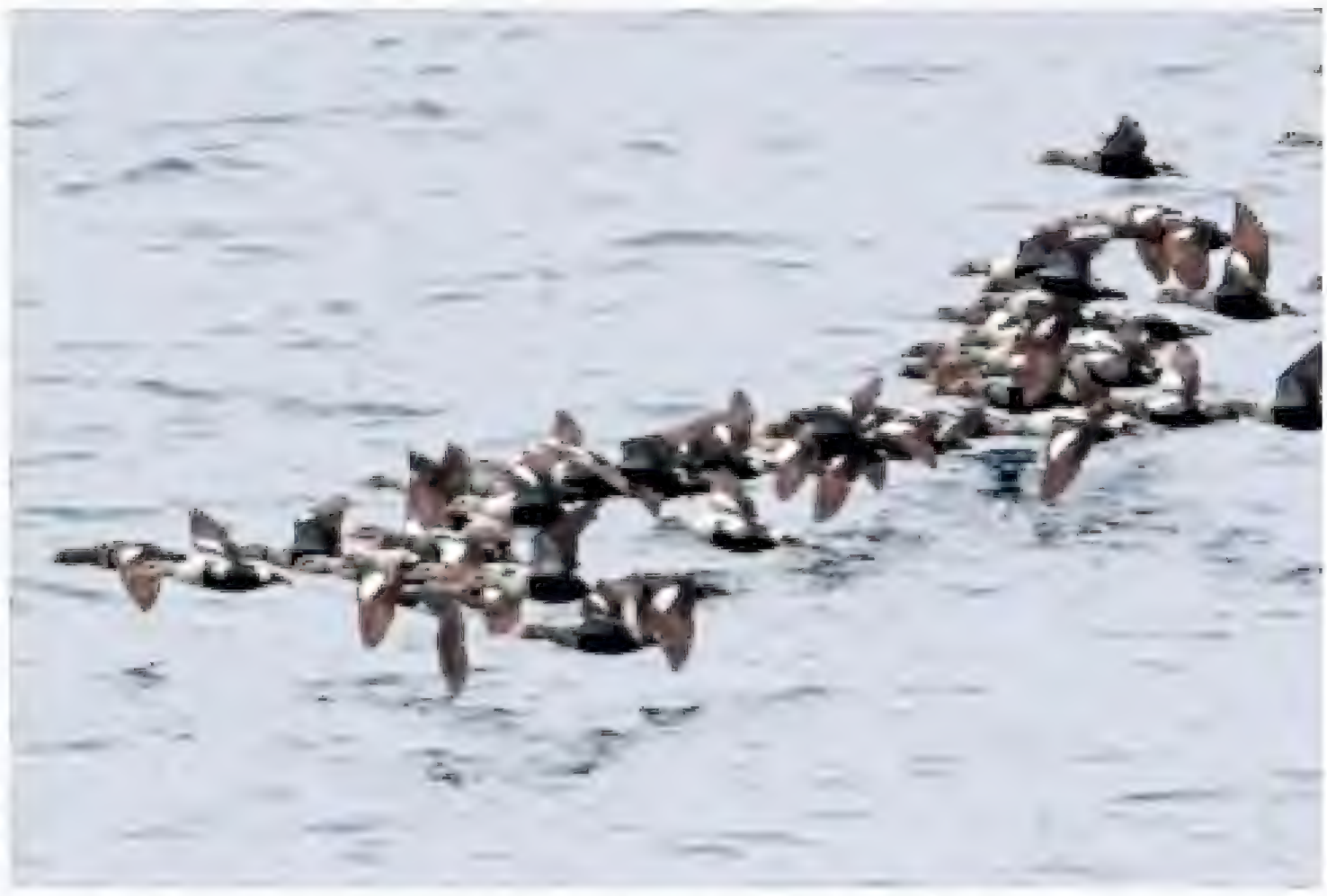
Ultimately, the grounding of so many endangered seabirds resulted in a swift change in lighting protocols at the facility, reducing light–induced seabird grounding to near zero during our study period. While there have been studies that consider the relative merits of using different types of lights, or lights in certain spectra, simply reducing artificial lighting to the minimum required for operational capabilities can be the fastest and most effective method for ameliorating the problem. This can be undertaken in a number of ways including (i) removing all unnecessary lighting, (ii) utilizing shielded low–intensity lights (to prevent upward spillage of light), (iii) ensuring that lights are only turned on when necessary, (iv) utilizing timer switches to ensure lights are turned off when not in use, (v) utilizing motion sensors to ensure lights only turn on when needed, and (vi) having adequate shielding on windows to prevent interior lights from spilling outwards (e.g. curtains, shutters or glazes on the windows).

To read the full paper, please visit the following link: Project MUSE - The Impact of Light Attraction on Adult Seabirds and the Effectiveness of Minimization Actions (jhu.edu)

King Eider migration in the Chukchi Sea — July 23–25, 2023

Mark Rauzon, Seabird Observer, USFWS volunteer (mjrauz@aol.com)

As the Canadian Coast Guard icebreaker CCGS *Sir Wilfred Laurier* moved to our last station, DBO5-2, where we sampled at the edge of Barrow Canyon, a deep channel into the Arctic Ocean, I began to see male king eiders (*Somateria spectabilis*) moving south in long migrating flocks, as literally thousands flew south in hundred-bird skeins. They were not close (they know the reach of a rifle), but we were able to see them on radar going eight knots south 2.9 miles out. Seeing them reminded me of the historical recounts of early ornithologists seeing vast eider flocks amidst the ice pack. Alfred Bailey's monograph, *Birds of Arctic Alaska*, published in 1948 by the Colorado Museum of Natural History, stimulated my keen interest in 1975 when I picked up the book at a remainder sale for five dollars, and 48 years later, got to have a similar experience. Despite the diminishment of Arctic species, here was a time-honored spectacle still echoing the past glories, like a living bio-diorama. Bailey writes: "The handsome King Eider were exceedingly numerous along the north coast of Alaska during migration in 1922…. Hersey gives an excellent account of the fall migration on males leaving the breeding grounds. His ship was caught in the ice off Wainwright from August 10 to 20 and during those days migrating flocks of King Eiders were constantly passing. They were in flocks of from 75 to 300 following the shoreline but keeping at least a mile from land. During his ten days of observation 'there appeared to be no diminution in the number of birds coming out of the north."



King Eiders, males migrating near Point Hope. Image credit: Mark Rauzon.

Skeins of King Eiders migrating south off the ice edge near Utqiagvik. Image credit: Mark Rauzon.

Skeins of King Eiders migrating south off the ice edge near Utqiagvik. Image credit: Mark Rauzon.

In *The Birds of Alaska*, the 1959 field workers bible, Ira Gabrielson and Fredrick Lincoln write: "The migration along the shores of the Bering Sea and Arctic coast is remarkably spectacular. We see them first two miles away. A twisting, shimmering line of birds flying close to the water, miraged in such a manner that each bird seems to be connected by an

elastic string to its reflection in the water. As they rise and fall in their flight, this elastic string seems to lengthen and shorten and grow narrower and wider. The effect of a thousand birds so seen almost makes one believe he is 'seein' things…"

I felt a connection to these past field biologists — a mute pride in the privilege in seeing what they saw a century ago still impressively flying at the ice edge. Bailey put it subtly: "The sight of long strings of fast-moving eiders of four species, murres, puffins, cormorants, and gulls in seemingly endless chains is one of the memories of a field man's experience on Bering Strait."

EIDER MIGRATING OVER THE FLOES
When lulls occurred, thousands of eider and other species started their northward flight—an almost endless chain of birds stringing above the ice floes.

Birds of Arctic Alaska by Alfred Bailey (1948).

Assessing the risk: identifying seabirds and seals most at risk from climate change

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Marine predators such as seabirds and seals are facing unprecedented threats due to climate change. These animals are especially vulnerable during their breeding seasons, when their young are most vulnerable to predation, diseases, extreme weather, etc. The unique dual dependency of these predators—breeding on land but relying on the ocean for food—makes them susceptible to changes in both habitats. Understanding which species are most at risk and identifying the specific threats they face is crucial for prioritising conservation efforts and efficiently allocating limited resources.

Our research offers a comprehensive climate risk assessment for 53 marine predator species, including 43 seabird and 10 pinniped species, across southeast Australia, subantarctic Macquarie Island, and Antarctica. Using this new trait-based climate risk assessment framework, we identify the species most vulnerable to climate change, especially during breeding season. This research provides guidance for conservation organisations to prioritise their efforts based on specific threats for given species.

What are the main threats?

Our research highlights extreme weather events as the most significant threat, negatively affecting 36 of the studied species. The most frequent events include snowstorms, heavy rain, strong winds, floods, storm surges, and heatwaves. Longer-term shifts in habitat suitability and prey availability driven by climate change were also significant threats, affecting 23 species. These environmental changes threaten not only immediate survival of seabirds and seals but also their long-term population trends and demography.

What are the most vulnerable species?

Among seabirds, the species identified with highest climate urgency include the Shy Albatross (*Thalassarche cauta*) and Southern Rockhopper Penguins (*Eudyptes chrysocome*). Their high risk status is due to a combination of their life history traits, ecological requirements, and the direct effects of climate change on their breeding success and survival.

Shy Albatross breed exclusively on three remote islands in Tasmania with limited at-sea distribution during the breeding season. The threats they face are mostly extreme

weather events along with occasional tick-borne disease outbreaks, and competition with Australasian Gannets (*Morus serrator*) at one of the breeding colonies. Southern Rockhopper Penguins, however, are primarily threatened by longer-term changes in climate, leading to poor body conditions, reduced reproductive investment, and high adult mortality. Extreme rainfall events occasionally result in significant breeding failures for these penguins.

Figure 1. Shy Albatross incubating an egg on Albatross Island. Image credit: Milan Sojitra.

The growing threat of extreme weather

Recently, the world experienced its hottest single day on record, a 50°C temperature anomaly in Antarctica, severe heatwaves in Europe, and catastrophic floods across the Americas, Africa, and Asia. These extreme weather events are stark reminders of the accelerating pace of climate change and its far-reaching consequences.

Like human systems, marine predators are also vulnerable to such extreme occurrences with significant breeding failures recorded worldwide. The latest IPCC AR6 report predicts a heightened frequency and increased severity of extreme weather events, suggesting that their ecological impacts on marine predator populations will become increasingly prominent and concerning in the future. For instance, Shy Albatross chick mortality increases significantly during extreme or persistent heatwaves (1), Adélie Penguins (*Pygoscelis adeliae*) in Antarctica have faced complete breeding failures due to unusual rain events and changes in sea-ice (2), and severe snowstorms have caused breeding failures for many Antarctic seabirds (3). Marine heatwaves also slow chick growth and cause reduced breeding success for Common Diving-Petrels (*Pelecanoides urinatrix*) and Fairy Prions (*Pachyptila turtur*) in Bass Strait (4).

Figure 2. Southern Rockhopper Penguin colony with adults and chicks on Macquarie Island. Image credit: Penelope Pascoe.

Conservation Implications

Our findings indicate that certain groups of marine predators, including albatrosses, penguins, and eared seals, are particularly vulnerable to climate change. Studied species that breed in lower latitudes, such as those on temperate habitats and subantarctic islands, are at greater risk compared to those breeding in Antarctica. This pattern suggests that conservation efforts should prioritise for species in these regions, where the impacts of climate change are more pronounced and immediate.

Protecting critical breeding habitats is essential, as is implementing fine-scale monitoring protocols to detect and respond promptly to emerging threats. Developing threat-specific climate adaptation strategies is crucial. For instance, measures could include enhancing breeding habitats by promoting native vegetation, supplementing artificial nests to protect against extreme elements, or even translocating species to more suitable environments if their current habitats become untenable.

Conservation efforts are often more feasible on breeding grounds than across vast oceanic habitats, making these areas a focal point for intervention. However, protecting

breeding sites alone is not sufficient, comprehensive strategies must also address the broader environmental changes affecting these species throughout their life cycles, including during migration and foraging at sea. Tackling climate change effectively will require international cooperation to implement global emission reductions, protect critical habitats, and coordinate conservation strategies across national boundaries.

Figure 3. Graphical abstract for Traversing the land-sea interface: A climate change risk assessment of terrestrially breeding marine predators. Figure credit: Milan Sojitra and co-authors.

Collaborative efforts for future research

Protecting at-risk species will require a collaborative approach between policymakers, industry and the blue economy, along with scientists and conservation managers. By identifying the species most at risk and understanding the specific threats they face, our research provides a roadmap for targeted conservation efforts. Engaging with stakeholders from various sectors is critical to developing and implementing effective conservation strategies that can address the complex challenges posed by climate change.

Our findings also highlight the need for further research, particularly on at-risk species as well as lesser-studied species and climate hazards. As the impacts of climate change continue to intensify, it is crucial to address knowledge gaps and revisit this assessment in future. Ultimately, safeguarding these species and their ecosystems in an era of

unprecedented environmental change will depend on our collective ability to act swiftly, decisively, and collaboratively.

For a deeper dive into our findings, you can read the full paper (5): Sojitra et al. 2024. Traversing the land-sea interface: A climate change risk assessment of terrestrially breeding marine predators.

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In memoriam

Helen Coxhead McFarland: a sketch of a life

By Craig S. Strong and Deborah L. Jaques

All there was

Helen being herself.

All that natural born skill in art

Such familiarity and love for her animals,

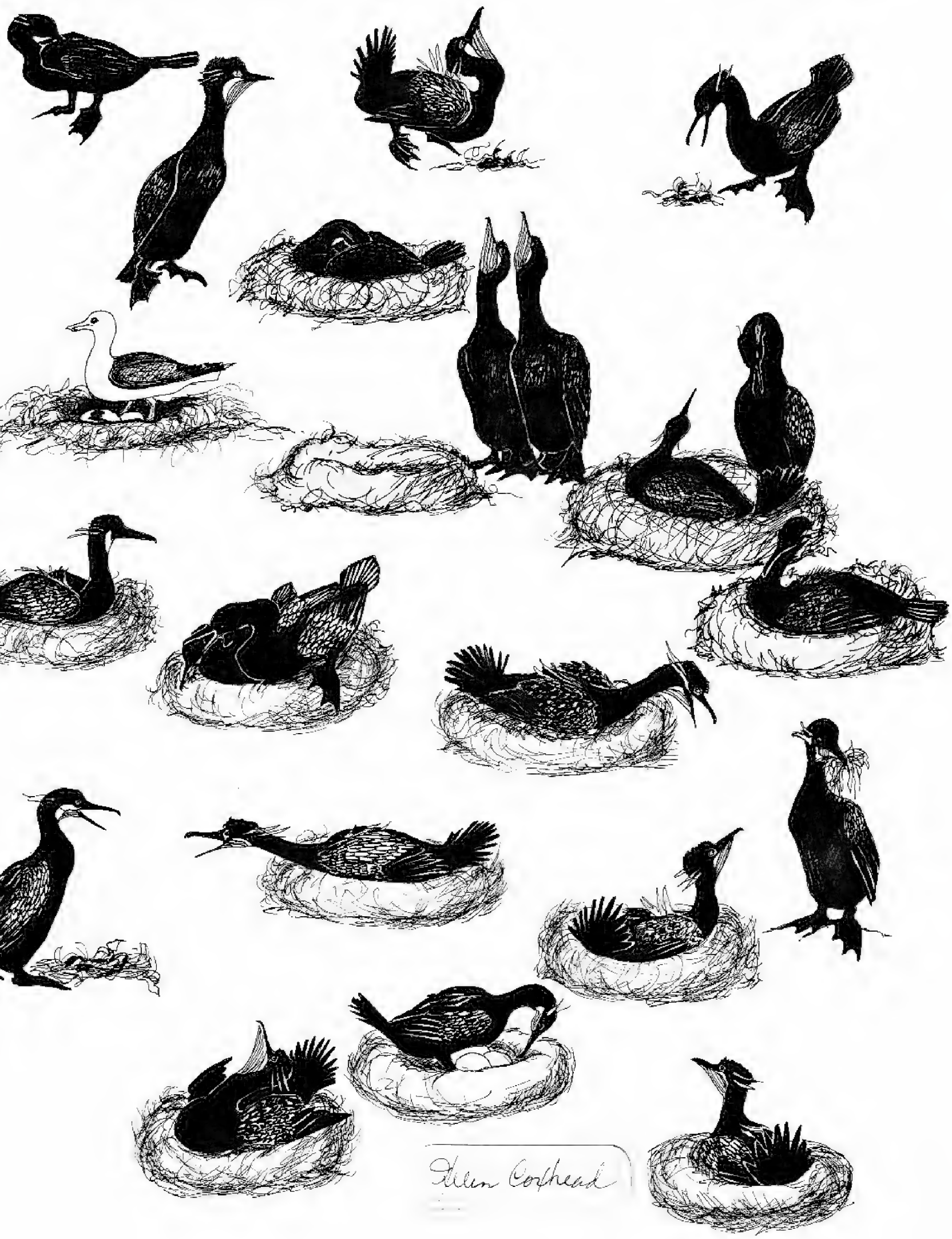
with a flair for fantasy!

It comes through, the love of color. Crossed over 3 July 2024

Helen Coxhead began drawing and painting at an early age, growing up in the Berkley Hills of California. She had a love of nature and animals, especially horses. In 1968, she took a job at the Point Reyes Bird Observatory (PRBO) as a secretary. Little did the organization know upon hiring Helen how much value she would add to that position with her ability to depict seabirds in an accurate and artistic way. Helen contributed many annual report covers for PRBO in the early years (Now Point Blue Conservation Science), and took the "Founders photo" of the first Pacific Seabird Group members. She also created the enduring first logo of PSG, seen in most of the initial annual meeting reports.

Through her association with Dr. David Ainley, Helen had the opportunity to visit many seabird islands during the 1970's, including Farallon Islands National Wildlife Refuge, Dry Tortugas National Monument in Florida, and islands in the Gulf of California. Always with sketchbooks, and quick to make use of the limited time between research activities.

Helen had an amazing ability to capture the essence of seabirds with a few strokes of the pencil. She sketched the birds "en plein air" to serve as a reference for drawings and paintings to be completed later. Helen paid careful attention to proportions and included written descriptions of colors and textures. Through Helen's hand, the behaviors and personality of the various species come through in a way that photography does not offer. The features left out or suggested give a lifelike feel to the fleeting moments that Helen was able to capture on the seabird colonies she visited.


Ellen Cothead

PRBO initiated long term research and monitoring of marine birds and mammals on the Farallon Islands in 1972. With Dr. Ainley, Helen was able to visit the remote islands many times to document the seabirds in her own way. She drew from the observation blinds, birds in the hand caught during mist netting, as well as dead birds. Helen was inspired by the abundant wildlife and enthusiastic researchers surrounding her. Helen produced a huge body of work during her time at PRBO, including detailed drawings, graphics for the newsletter and T-shirts, multiple logos, and exquisite watercolor paintings.

LEACH'S STORM-PETREL

ASHY STORM-PETREL

H. COXHEAD

An oil spill between two Standard Oil tankers occurred off San Francisco in 1971. This led to the formation of International Bird Rescue and a wave of environmental legislation. The PRBO response included documenting injury and mortality of seabirds on Bay Area beaches, which led to the development of procedures and protocols for standardized beachwalk surveys. Helen contributed illustrations to the first manual used to identify dead birds on beaches, including precise detailed renderings of feet and beaks drawn to scale, to enable identification of birds that were covered in oil, partially scavenged or decomposed. This was a large and innovative effort, and all of Helen's practice in the field helped pave the way to a successful product (NOAA, Ainley et al. 1994), which was used during oil spills and beached bird monitoring for decades.

Throughout her career, Helen painted grand landscapes and hundreds of watercolor horse and antelope pictures. She started out as a cowgirl and became a good horsewoman, competing in many endurance rides. This was in addition to managing large gardens and running a sheep farm (and weaving her rug designs with the wool). She also designed and printed silkscreen cards throughout her life, assembling over 120 unique designs, all created with colors mixed by hand to her liking. From her tenure with seabirds and seabird islands, Helen created 8 seabird notecards, pictured below. Should PSG members like to purchase cards, all proceeds will be donated to the Pacific Seabird Group travel fund. Contact Craig Strong to purchase cards or to see a larger showing of Helen's art: strongcraig1@gmail.com.

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From the archive

Compiled by the Pacific Seabirds Committee

As you may know, this all-online format of *Pacific Seabirds* is brand new, but the publication itself—the official publication of the Pacific Seabird Group (PSG)—has been around since the very early days of PSG! In fact, *Pacific Seabirds* began as the *Pacific Seabirds Bulletin* in 1974 and ran that way for 20 years before its name was changed to what it is today.

Over the decades, the publication has taken many forms and shapes, but it has always served as a method of providing members with recent news on financial reports, Annual Meetings, regional reports, conservation news, special events, awards, decisions of the PSG, and more! And the best part is every issue of *Pacific Seabirds*—dating all the way back to that initial issue of the *Pacific Seabirds Bulletin* in 1974—is available online for you to check out and enjoy!

If you visit Volume 24(2) from 1997, you can read an article about the origins of the Pacific Seabird Group by Jim King; check out articles on Long-billed Murrelet, Ancient Murrelet, Slaty-backed Gull, and Caspian Tern; or visit the Bulletin Board towards the end of the publication, demonstrating how we still share job opportunities, member updates, and other announcements with the members of PSG. One of our favorite articles in the issue, found in the Forum section, is *Mortality of Seabird Biologists* by Mark Rauzon. In it he recounts a scary moment in the field and what we risk for our strange and wonderful careers. See this article below or find it on page 49 of Volume 24(2).

We hope you enjoy exploring issues of *Pacific Seabirds* from the archive as much as we do and get inspired to submit an article, poem, photos, or update for the next issue!

FORUM

MORTALITY OF SEABIRD BIOLOGISTS

Mark J. Rauzon

Josh Nove, age 23, disappeared into Mother Goose Lake, on the Alaska Peninsula, on July 3, 1997. He was attempting to capture Mew Gull chicks in shallow water when he apparently stepped into a deep hole and never surfaced. He was wearing rolled down hip boots that probably filled with 42 degree, silt-laden water. To date, searchers have not found his body. Josh Nove was a lifelong birder who volunteered for the USFWS. He was having the experience of a lifetime, his first field work in Alaska, fresh from college, and just beginning his career in seabirds. Our deepest sympathies go out to his spirit in Mother Goose Lake and to his family in Ipswich, Massachusetts.

In a Twilight Zone manner, when I saw the headline "Volunteer bird biologist vanishes," I quickly scanned the facts to see if it were me - not Josh - who vanished. This summer, I was also a volunteer biologist, twice the age of Josh, and having the time of my life in the Bering Sea. However I had started the field season with apprehension. With only a two-minute survival time in the cold water with no local Coast Guard to respond, I resigned myself to knowing a boating accident is a one-way ticket.

So, having created a psycho-drama in my mind, I got the chance to manifest it in reality and I fared poorly. In mid-June, I spent several uncomfortable hours sitting in an aluminum boat. The engine had died and landfall at St. Lawrence Island was far off in the fog. Luckily, seas were calm so Bert Oozevaseuk and Caleb Pungowiyi could attempt to restart the engine. It was midnight and though the sun had not set, a gray gloom surrounded us. El Niño not withstanding, the ocean chill crept into the metal boat and into my feet and butt. I got into this situation after a previous long night of boating. I was exhausted, dehydrated and cold; it was impossible to fit on any more clothes. In a poor frame of mind, I contemplated my mortality. I could see hypothermia on the horizon, an hour or two away. I felt a seed of panic, not unlike experiencing heavy air turbulence and fear . . . "so this is how I'm going to go." To combat the mind chatter, I chanted a mantra - Om Mani Padmu Hum. Oh, mama, papa help me!

It worked, and after many fits and starts, so did the engine. We made to shore. My Yupik colleagues evidently had a different experience, for they knew they would make it back. I was the disbeliever.

In subsequent contemplation on the long days on the ancient island of St. Lawrence, surrounded by bones of marine mammals and, not infrequently, the bones of humans, I appreciated just how crazy our profession really is. We put ourselves in some of the riskiest situations in to order to get close to seabirds, creatures so alien from our land mammal world. To study them, we mimic their modes of transport, we fly in low level aircraft, at slow speeds, over icy oceans, far from land. We power out on boats, small and large, tossed by the sea, throwing up and expose our skins to ultraviolet-laden light, dehydrating and salting away like pemmican. We cling to cliffs of rotten rock and muddy soils, or stand in the darkest hours under a towering redwood craning our necks. The risks are real and it is fortunate that Poseidon, Neptune, Kane, Mater Cara, Queen of the Ocean, protects us most of the time.

That's why the passing of Josh Nove is so poignant. It could have been any of us at many different points in our careers. I choose to believe that Josh's last name, Nove, suggests his special fate. Nove, or Nova, is a passing star whose brightness is intense and sudden, then quickly fades away. Josh's lesson to us is to redouble our efforts to save seabirds, and to have the experience of a lifetime every time we are in the field.

By ***Mark J. Rauzon***, Post Office Box 4423, Berkeley, California 94704, USA